

WHAT IS CLAIMED IS:

1. An optically coupled semiconductor device comprising:

a multi-layer wiring substrate which is
5 constituted by stacking a second wiring substrate on a first wiring substrate and which has an opening formed in the second wiring substrate;

10 a mount electrode and an electrode for wire-bonding which are formed on a top main face of the first layer and which are disposed at diagonal positions of the opening formed in the second wiring substrate;

15 a light-emitting device whose one terminal is electrically connected to the mount electrode and whose other terminal is electrically connected to the electrode for wire-bonding electrode via a wire and which is arranged so that a light-emitting face thereof may face the opening;

20 a first electrode pad and a second electrode pad which are provided on the top main face of the second wiring substrate in such a manner as to sandwich the opening formed in the second wiring substrate;

25 a photo-receptor element which is arranged in such a manner as to block the opening formed in the second wiring substrate and which is electrically connected to the first electrode pad so that a light-receiving face thereof may face the light-emitting face of the

light-emitting device;

a switching element which is arranged in such a manner as to block the opening formed in the second wiring substrate and which is electrically connected to the second electrode pad so as to face the wire; and

5 a sealant which seals the opening formed in the second wiring substrate.

2. The optically coupled semiconductor device according to claim 1, wherein the wire is extended substantially along a diagonal line of the opening.

10 3. The optically coupled semiconductor device according to claim 1, comprising:

a first external electrode which is provided on a face opposite to a face on which the mount electrode of the first wiring substrate is provided; and

15 a notch which is formed in a semi-circular cross section state in a side periphery face of the first wiring substrate and which is wired on its surface to electrically interconnect the mount electrode and the first external electrode.

20 4. The optically coupled semiconductor device according to claim 1, comprising:

a second external electrode which is provided on a face opposite to a face on which the mount electrode of the first wiring substrate is provided; and

25 a notch which is formed in a semi-circular cross section state in side periphery faces of the first and

second wiring substrates and which is wired on its surface in order to electrically interconnect the electrode pad and the second external electrode.

5. The optically coupled semiconductor device according to claim 1, comprising:

a first external electrode which is provided on a face opposite to a face on which the mount electrode of the first wiring substrate is provided; and

10 a through-hole which is vertically formed through the first wiring substrate and wired on surface to electrically interconnect the mount electrode and the first external electrode.

6. The optically coupled semiconductor device according to claim 1, comprising:

15 a second external electrode which is provided on a face opposite to a face on which the mount electrode of the first wiring substrate is provided; and

20 a through-hole which is formed through the first and second wiring substrates and which is wired on its inner surface to electrically interconnect the electrode pad and the second external electrode.

7. An optically coupled semiconductor device manufacturing method comprising:

25 stacking a second wiring substrate having an opening on a first wiring substrate to constitute a multi-layer wiring substrate;

forming a mount electrode and an electrode for

wire-boding on a top main face of the first wiring substrate so that they may be disposed at diagonal positions of the opening;

5 electrically connecting one terminal of a light-emitting device to the mount electrode and the other terminal to the electrode for wire-bonding via a wire so that its light-emitting face may face the opening;

10 providing a first electrode pad and a second electrode pad on the top main face of the second wiring substrate so as to sandwich the opening formed in the second wiring substrate;

15 arranging a photo-receptor element in such a manner as to block the opening formed in the second wiring substrate and electrically connecting the photo-receptor element to the first electrode pad so that its light-receiving face may face the light-emitting face of the light-emitting device;

20 arranging a switching element in such a manner as to block the opening formed in the second wiring substrate and electrically connecting the switching element to the second electrode pad so that the switching element may face the wire; and

25 sealing the opening in the second wiring substrate with a sealant.

8. The optically coupled semiconductor device manufacturing method according to claim 7, wherein:

the plurality of multi-layer wiring substrates are

formed on a molded base material; and

dividing grooves are previously formed in the
molded base material to partition the molded base
material into the multi-layer wiring substrates,
thereby separating the wiring substrates from each
other along the dividing grooves.

5

9. The optically coupled semiconductor device
manufacturing method according to claim 7, wherein:

10

the plurality of multi-layer wiring substrates are
formed on the molded base material; and
the molded base material is divided into the
multi-layer wiring substrates by a dicing cutter.